SCIENCE

[Entered at the Post-Office of New York, N.Y., as Second-Class Matter.]

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

SEVENTH YEAR.
VOL. XIV. No. 344.

NEW YORK, SEPTEMBER 6, 1889.

SINGLE COPIES, TEN CENTS.
$3.50 PER YEAR, IN ADVANCE.

THE JULIEN ELECTRIC TRACTION SYSTEM.

THE Julien electric cars have now been in regular passenger service for a little over two years in Brussels; and a report has just been prepared of the cost of motive power during that time, including the renewal of batteries, the wear and tear on motors and machinery, the generating and storing of the energy, and repairs and replacements generally, — in fact, every element that can be understood by an engineer to be motive power. It is found that the cost of motive power has been a trifle less than three cents per kilometer, or about five cents per car-mile; in this, the cost of three and five-tenths cents per car-mile net, including depreciation on battery, cost of generating current, and handling of batteries.

The car shown in the accompanying illustration, Fig. 3, has been in constant use in this city for several months, and is of the type selected by the Julien Company as the standard for their service. It has a sixteen-foot body mounted on a rigid truck with a six-foot wheel base, which carries two ten horse-power electric motors, — the truck being entirely independent of the car body, and may be removed if necessary. The weight of the car, with motors, gearing and battery in position, is between six and seven tons. The motors are geared direct, one to each axle, and are accessible from

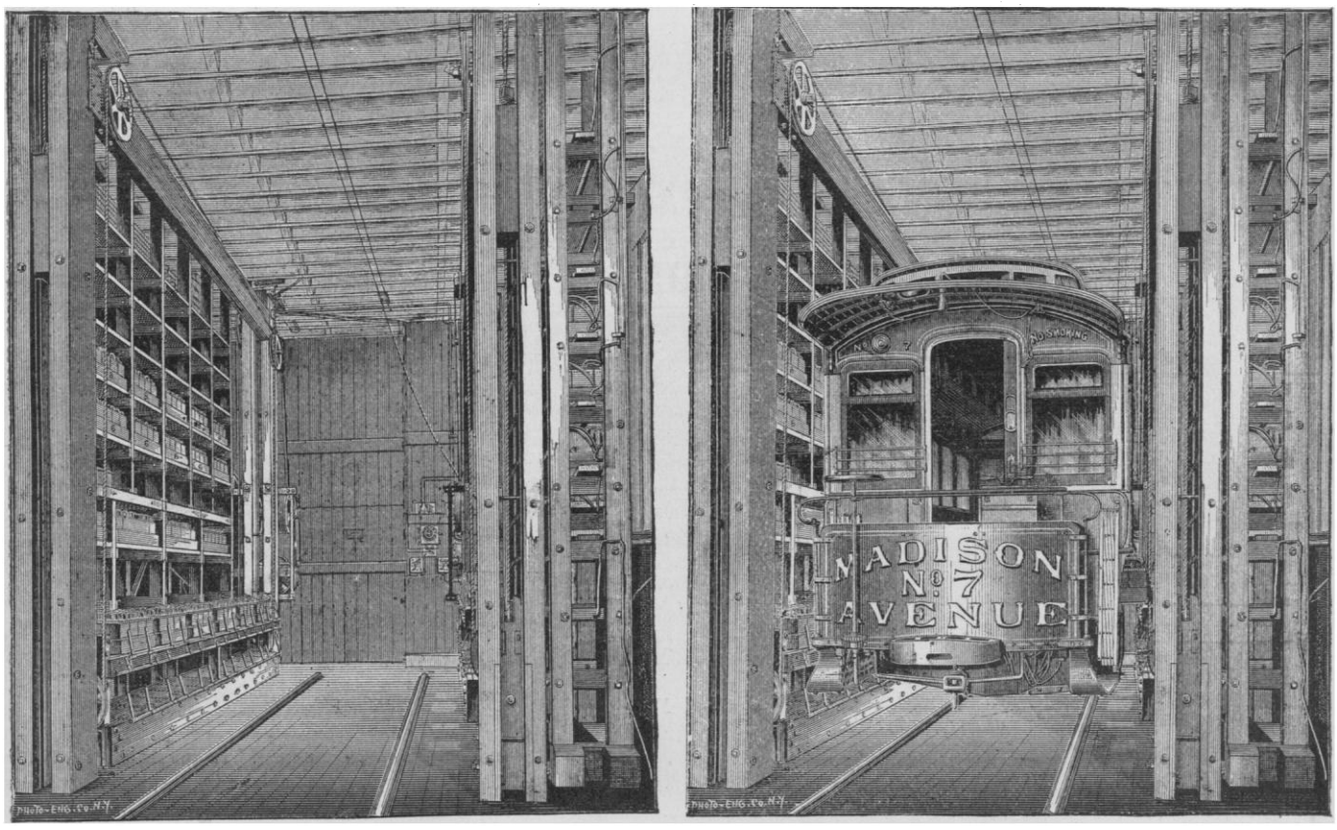

FIG. 1 AND 2.—STORAGE BATTERY CHARGING RACK, JULIEN ELECTRIC CAR STATION.

maintaining the batteries has amounted to a cent and six-tenths per car-mile.

It may be of interest to know that the estimate of the cost of motive power as based on the experiences of the Julien Electric Traction Company on the Fourth and Madison avenues, and prepared prior to the report at Brussels, and without any knowledge of the cost there, is within a fraction of being the same. The Julien Company find the cost of motive power on Madison Avenue to be five and three-tenths cents per car-mile. In the cost of motive power as estimated in New York, however, was included interest on investment, amounting to one and eight-tenths cents, or the car floor by trap-doors. The battery consists of 108 cells, which are placed in six trays of nine each on each side of the car under the seats; these trays are placed in the car by dropping the side panels.

The chief difficulty encountered in the operation of the Fourth Avenue line was the handling of the batteries, but recent improvements have entirely overcome this difficulty. First, a flexible connector was devised, by which it is possible to couple up cells with great rapidity. Next a battery rack was constructed large enough to store batteries for ten or twelve cars. This rack is shown in Figs. 1 and 2. This rack makes it possible to remove the batteries from

a car and replace them by another set in from two to three minutes. When the car enters this rack, its panels are dropped down on either side and thus form bridges over which the batteries are withdrawn from and replaced in the car. While this change is being made, a competent person inspects the regulators of the car. The motors, gearings, and connections are only inspected once a day, and that at the end of the day's work.

GOLD EXTRACTION BY A NEW PROCESS.

IN many places where gold-bearing quartz is found containing a sufficient percentage of the metal to pay for working it, there is either an entire absence of the water necessary to work the process at present employed for its extraction, or it can only be obtained at great expense and trouble, in many cases only part of the year. Hitherto the processes used for extracting the gold from the alluvial deposit or from crushed quartz have required large quantities of water to flush the fine, pulverized material containing the gold, and even with the best methods large quantities of gold were carried off with the earth and quartz and lost before it reached the mercury.

The need of some ready method for the dry extraction of the gold has long been felt, but until recently the various machines proposed have not been found equal to the old processes. The various difficulties in the way of dry extraction have apparently been overcome in a new machine which was exhibited in London a few weeks ago. By this process, as described in *Iron*, the use of mercury is dispensed with, and the gold is extracted readily from alluvial deposits or quartz. The process is also applicable to the extraction of any combination of metals from refractory ore. One of the machines exhibited weighed but six pounds, and was intended to form part of the outfit of the prospector, by the use of which he could quickly determine whether any specimens of quartz contained gold, by simply crushing it with a hammer and running it through the machine. The mechanism of this apparatus consists of an inclined ladder with fine wire cloth upon one side and silk upon the other. A blast of air is passed up and down through the two meshes, blowing off the light particles of dirt and quartz and allowing the free gold to be retained simply by gravity. Another machine is adapted for concentrating various metals from rock, such as sulphates of copper, lead, zinc, and antimony, making the future separation of the valuable metals from the metallic mass, by roasting or chemical processes, an easy matter. During the exhibit an interesting experiment was made to show the value of the machines, and the thoroughness with which they performed their work. The machine used in the experiment weighed about five hundred-weight, and was so compact that it could be readily transported from one place to another. A quantity of gold in minute particles, weighing six drams, and two small nuggets, were put into a large pan with two hundred-weight of gravel and grit, and the whole mass put into the machine, which was operated with about a quarter-horse power, or, as an equivalent, two-man power.

FIG. 3.—STANDARD ELECTRIC CAR, JULIEN STORAGE BATTERY SYSTEM.

The principle of the machine is similar to the small separator used for prospecting purposes, with the blast of air driving off the fine particles of extraneous material, while "oscillating riddles containing shot shake off the heavier grit and stones, allowing free gold to sink by gravity into the shot, where it is retained, and in turn falls to the bottom of the shot." In about a minute after the mixture was placed in the machine the whole treatment was completed, and of the amount of gold originally put into the machine 96.3 per cent was recovered. With more time devoted to the separation, a considerably smaller percentage of loss would doubtless have ensued.